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METHODS OF SAMPLING IRON ORE SINTERS

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Indian Standard

METHODS OF SAMPLING IRON ORE SINTERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 5 March 1986, after the draft finalized by the Methods of Sampling Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Iron ore sinter is an agglomerated product suitable for charging in the blast furnace obtained by incipient fusion of iron ore fines along with constitutents such as coke breeze, flux, sand, mill scale, flue dust and other metallurgical wastes.

0.3 Iron ore sinter is used extensively in steel plants as charge in the blast furnace. Both physical and chemical properties are important for sinters and they need to be monitored by taking samples and testing them at appropriate stages.

0.4 This standard provides guidelines for sampling and sample preparation of iron ore sinters. In preparing this standard, the sampling practices prevalent in steel plants in our country have been taken into consideration.

0.5 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 Since sintering plants or iron ore fines are captive plants in steel mills, sampling of iron ore sinters is done mostly in the premises of steel plants. This standard covers guidelines for sampling and sample preparation of iron ore sinters.

2. GENERAL PRECAUTIONS IN SAMPLING

2.1 Sampling of iron ore sinters shall be carried out when the material is in motion. The interval between successive increments shall be decided in advance and not at the time of sampling. Overfilling of sample

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*Rules for rounding off numerical values (*revised*).

containers shall be avoided. Sample preparation and testing shall be carried out as early as possible after sampling.

3. TERMINOLOGY

3.1 Lot — The quantity of sinter considered to be homogeneous for the purpose of sampling.

3.2 Increment — The quantity of sinter obtained by a sampling device at one time from a lot or sublot.

3.3 Unit Sample — The quantity of sinter collected at one time by means of mechanical sampling.

3.4 Gross Sample — The quantity consisting of a number of increments or unit samples taken from a lot.

4. SINTER SAMPLING METHODS

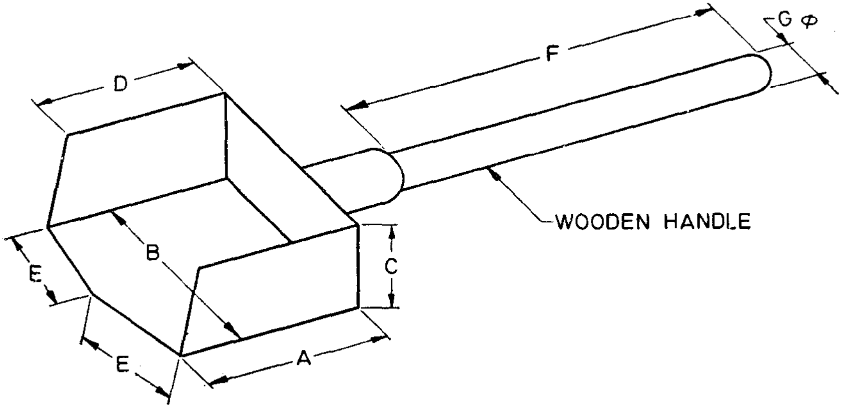
4.1 Sampling at Sintering Plant End — Sampling of iron ore sinter at the sintering plant will help in monitoring the chemical composition of the sinter and in assessing the breakage of sinter during transport from sintering plant to blast furnace skip. For this purpose, unit samples of 50 kg each shall be collected every hour by mechanical means. The unit samples of every 4 hours shall be combined into a gross sample which shall be subjected to size determination. A part of the gross sample shall be kept for physical testing and samples for chemical analysis shall be prepared from the rest. The two parts kept for physical testing from two gross samples in a shift shall be combined together to form physical test sample for the shift.

4.2 Sampling at Discharge End — Sinter samples may also be collected from the discharge end of the belt to blast furnace bunker at an interval of half an hour. For this purpose, the sinter moved to blast furnace in one shift of 8 hours shall be taken as a lot. Where facilities for automatic sampling system exist, the sample consisting of a unit sample of 50 kg is collected by a trolley which moves on a rail track and moves across the whole width of the conveyor belt. If there is no provision for automatic sampling, a sampling scoop of 8 kg capacity as shown in Fig. 1 shall be used to collect sinters samples at the rate of 3 increments every half an hour. The increments collected in one shift shall be combined together to form a gross sample which shall be subjected to size determination. After this a part of this sample shall be taken out by sample reduction for carrying out physical tests such as tumbler and shatter index. The rest of the sample shall be prepared for chemical analysis as in **4.4**.

NOTE — Four kilogram scoop may be used if the maximum particle size is 40 mm, taking care that the total gross sample per shift is more than 300 kg.

4.3 Sampling from Blast Furnace Bunkers — After the sinter is transported to blast furnace bunkers, it is necessary to collect sinter samples from the bottom of the operating bunkers in order to check the degradation due to impact and abrasion. For this purpose, samples shall be collected twice in a shift from all the operating bunkers of all the furnace. An increment of 40-50 kg for each furnace shall be collected when the sinter is discharged from the operating bunkar into the scale car. All these increments collected during a shift from different operating bunkers shall be combined to form a gross sample for the shift. Alternatively, samples may also be collected manually from sinter vibrators of individual blast furnaces at the rate of two increments of 8 kg per hour for each blast furnace.

The gross sample thus collected in a shift shall be subjected to size determinations on screens 40, 25, 10, 5 and 3 mm.



NOMINAL CAPACITY	A	B	C	D	E	F	G
8 kg	200	200	100	175	115	440	40

All dimensions in millimetres.

FIG. 1 SAMPLING SCOOP

4.4 Preparation of Samples — The gross sample collected at sintering plant or from blast furnace bunkers shall be subjected to size determination and then a part of it shall be kept for physical testing. Sample preparation for physical testing shall be carried out as per the stipulations in respective test methods. Sample preparation for chemical tests shall be done in stages and one such method is illustrated in Fig. 2.

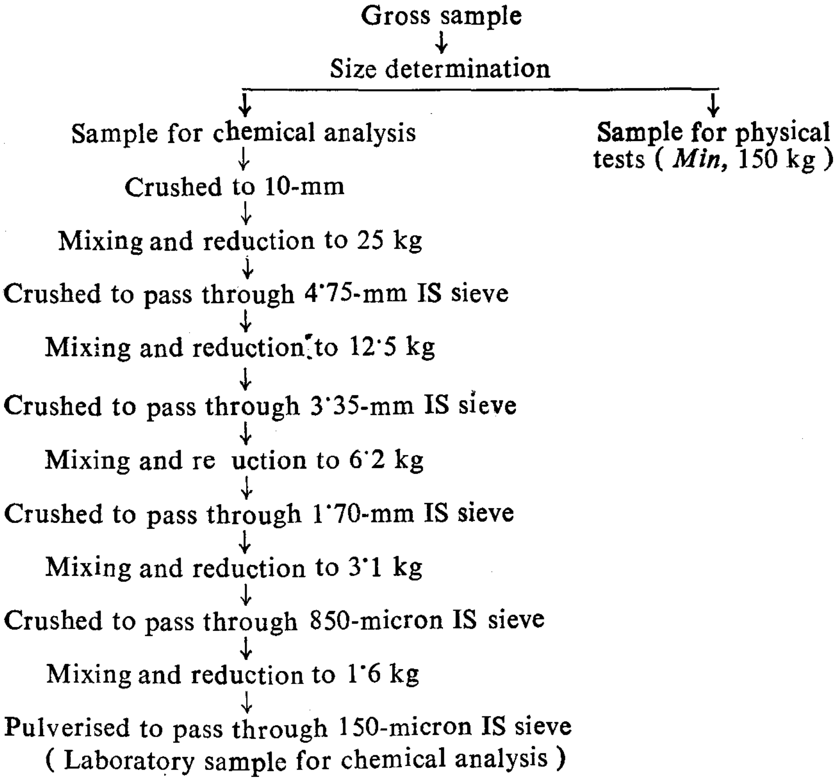

Gross sample
Size determination
Sample for chemical analysis
Sample for physical tests (*Min,* 150 kg)
Crushed to 10-mm
Mixing and reduction to 25 kg
Crushed to pass through 4·75-mm IS sieve
Mixing and reduction to 12·5 kg
Crushed to pass through 3·35-mm IS sieve
Mixing and reduction to 6·2 kg
Crushed to pass through 1·70-mm IS sieve
Mixing and reduction to 3·1 kg
Crushed to pass through 850-micron IS sieve
Mixing and reduction to 1·6 kg
Pulverised to pass through 150-micron IS sieve
(Laboratory sample for chemical analysis)

FIG. 2 STAGES IN REDUCTION OF GROSS SAMPLE

5. TEST RESULTS OF IRON ORE SINTER

5.1 The chemical and physical tests on iron ore sinters shall be carried out as per IS : 9959-1981*. The test results corresponding to each lot (sinter moved during one shift) shall be reported individually.

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*Guidelines for iron ore sinters for iron making in blast furnaces.

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^{2}
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^{2}
Frequency	hertz	Hz	1 Hz = 1 c/s(s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^{2}